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ABSTRACT

Two-year old white boys from Low and High social class (SES) groups were presented with identical learning tasks under nonverbal and verbal conditions. Under the nonverbal condition there were no SES differences, but under the verbal condition the High SES group significantly improved their performance, and were superior to the Low SES group. (Author)

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Social Class Differences in the Ability of Two-Year Old Children to Use Verbal Information to Facilitate Learning

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Abstract

Two-year old white boys from Low and High social class (SES) groups were presented with identical learning tasks under nonverbal and verbal conditions. Under the nonverbal condition there were no SES differences, but under the verbal condition the High SES group significantly improved their performance, and were superior to the Low SES group.

Currently there is a great deal of theoretical and practical interest in discovering the mechanisms which account for social class (SES) differences in intellectual development. Setting aside the nature-nurture controversy, SES differences in intellectual performance have been attributed to differences in motivation, attention, perceptual-discrimination and language ability.

Since SES differences in intelligence first manifest themselves between 18 and 36 months of age, a period of rapid language growth, it seems reasonable to assume that these differences may largely be due to language (1). Several investigators have shown that language can facilitate learning (2), but there are no published studies on whether there are social class differences in this respect. We now report significant social class differences in the ability of two-year old children to use verbal information to facilitate learning, but no SES differences in motivation, attention, or perceptual-discrimination ability.

Fifty-six white two-year old boys were studied. Twenty-nine boys whose mothers are college graduates were compared with 27 boys whose mothers have not gone beyond high school. These will be referred to as the High (E1) and Low (E2) Education groups.

Children were presented with identical learning tasks, under verbal and non-verbal conditions, with each child trained under both conditions. The material to be learned was different but very similar under the two conditions. Under each condition the child was presented with five inverted boxes, on each of which was a different relatively unfamiliar object. The learning task involved finding a reward under the correct object. Two sets of five objects were used, with one set under each condition. The first set included a (1) valve, (2) caster, (3) clip, (4) switch, and (5) lock. The second set included a (1) strainer, (2) roller,

(3) level, (4) pole-end, and (5) opener. Both the sequence of conditions and materials were counterbalanced, so that half the children in each SES group were presented with the verbal condition first and half with the non-verbal condition first; half the children were presented with one set of five objects under one condition and half with the other set of five objects under the same condition. The learning tasks under each condition, which required about 30 minutes, were administered in the child's home approximately a week apart, to reduce the effects of fatigue, loss of attention or motivation.

Under the verbal condition, using the first set of five objects, which were placed in a row before the subject (S), the Examiner (E) said, "We're going to play a hiding game. I'm going to hide a cookie (candy, toy) under one of these, and you find it." E pointed to the valve and said, "This is a valve. First I'm going to hide the cookie under the valve." Two demonstration trials were given, to make sure the child understood what was expected of him. E placed the reward under the valve, allowing S to see where it was hidden, and urged the child to find it. When S searched under the correct object, E said, "That's right, it was under the valve." The valve was shifted to a different position and the procedure was repeated. No child failed to search under the correct object on the demonstration trials, either under the verbal or non-verbal condition, where Ss were only told, "Find the cookie." After the two demonstration trials, E placed a screen in front of the five objects and said, "Now, I'm not going to let you see where I hide the cookie." On each trial, just before removing the screen, E said, "The cookie is under the valve." Only those trials on which S searched under the valve first were counted as correct, but he was encouraged to search until he found the cookie, and was rewarded on every trial. When the child searched under the correct object, E said, "It

was under the valve." The position of the valve was varied from trial to trial. The criterion for learning each object was three successive correct trials. Once criterion for the first object was reached, E said, "The cookie will not be under the valve anymore. From now on it will be under the caster," which E pointed to. However, except for the first object, there were no demonstration trials. The same procedure was followed until S reached criterion on all five objects, or until a total of 30 trials have been administered.

Under the non-verbal condition, the procedure was the same, with the following exceptions: (1) S was not told the name of the object, nor was he verbally informed where the reward would be. E merely said, "Find the cookie." (2) When S searched under the correct object, E said, "You found the cookie." (3) When S reached criterion on an object, E shifted to the next object without verbally informing S, so that the first post-shift trial was a non-verbal cue that the reward would now be under a different object.

In order to make sure that Ss were not performing better under the verbal condition because of greater familiarity with the objects or their names, Ss were pretested to see if they could identify the objects. The five objects were placed in a row and E said, "Show me the valve. Show me the caster," and so forth. If S correctly identified an object, a second trial was given later, to determine whether the first response was due to chance. Very few of the children could identify any of the objects.

A two-way analysis of variance (ANOVA) was computed on the basis of the number of objects learned, with social class and learning conditions as the main effects, and a repeated measures design for learning conditions. As shown in Table 1, significantly more objects were learned under the verbal than under the non-verbal condition for both SES groups combined

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(ANOVA, F=21.43; d.f. 1; $p < .01$) but there was a significant social class by learning condition interaction (ANOVA, F=6.28; d.f. 1; $p < .05$). Further analysis, using the t-test, indicated that while there were no SES differences under the non-verbal condition (t=0.03), the High Education Ss (E1) did significantly better than the Low Education Ss (E2) under the verbal condition (t=3.20; d.f. 54; $p < .01$). Furthermore, whereas the performance of the Low Education Ss did not differ under the two learning conditions (t=0.98), the High Education Ss did significantly better under the verbal than the non-verbal condition (t=5.07; d.f. 56, $p < .001$). The range of objects learned under both conditions for both SES groups was 0 to 5, which indicates that it was possible for some 2-year old children to learn as many as five different objects in 30 trials, even on the more difficult non-verbal task.

The power of language to facilitate learning can be seen in the degree to which providing verbal information to children made it possible for them to shift to a new object and to reach criterion without error. The data was analyzed to see how many children in each SES group could make such errorless shifts under verbal and non-verbal conditions. Under the verbal condition an errorless shift has occurred when a child responded correctly on three successive trials after a new object has been introduced. Under the non-verbal condition an errorless shift has occurred when a child responded correctly on trials 2, 3, and 4. Trial 1 was considered a non-verbal information trial, and hence did not count, since the shift to a new object was made without verbally informing S in advance. As shown in Table 2 under the verbal condition 62% of the High Education Ss succeeded in making an errorless shift, in comparison to only 20% of the Low Education Ss, a significant difference ($X^2 = 9.71$; d.f. 1; $p < .01$). Under the non-verbal condition 10% of the High Education Ss and 16% of the Low Education Ss succeeded in making an errorless shift, a difference which was not significant ($X^2 = 0.38$).

An analysis of intra-SES-group differences between the two learning conditions indicated that High Education Ss showed significant improvement in amount of error shift performance from the non-verbal to the verbal condition (McNemar Test, $X^2 = 16.79$, d.f. 1, $p < .01$), and that there was no significant difference in the amount of errorless shift performance between the two conditions for the Low Education Ss. Whereas a large proportion of the High Education Ss were able to utilize verbal information to make an errorless shift, very few of the Low Education Ss could take advantage of verbal information to change their behavior, but were instead bound by their previous perceptual-motor experience.

It is possible that the superior performance of the High Education Ss under the verbal condition may have been due to a greater comprehension of complex verbal instructions ("The cookie will not be under the valve anymore. From now on it will be under the caster."), rather than a greater ability to use verbal information to change their behavior. In order to answer this question, the data was analyzed in terms of the number of trials to criterion for the first object, where the verbal information was much simpler ("The cookie is under the valve."), and where the Low Education Ss had shown their understanding of the instructions on the demonstration trials. A similar pattern of SES differences described previously was also present for learning the first object. Under the non-verbal condition the Mean number of trials to criterion for learning the first object was 19.41 and 19.85 trials for the High and Low Education Ss respectively. Under the verbal condition the Mean number of trials was 10.97 and 17.74 for the High and Low Education Ss. A two-way analysis of variance was computed, with social class and learning conditions as the main effects, and a repeated measures design for learning conditions.

Significantly fewer trials were required to learn the first object under the verbal than under the non-verbal condition for both SES groups combined (ANOVA, $F=10.04$; d.f. 1; $p<.01$). However, further analysis, using the t-test, indicated that there was no difference between the two SES groups under the non-verbal condition, but under the verbal condition the High Education Ss learned the first object in significantly fewer trials than the Low Education Ss ($t=2.37$; d.f. 54; $p<.05$), and the High Education Ss required significantly fewer trials to learn the first object under the verbal than under the non-verbal condition ($t=3.37$; d.f. 56; $p<.01$). The performance of the Low Education Ss did not differ under the two learning conditions.

This is the first direct evidence of social class differences in the ability of young children to use verbal information to facilitate learning, and may, in part, explain why SES differences in intellectual development first emerge between 18 and 36 months of age, as language becomes increasingly important for learning. SES differences in motivation, attention, or perceptual-discrimination ability cannot explain the results of the present study, since it can be assumed that these factors were operating and could equally affect children's performance under both verbal and non-verbal learning conditions. We attribute these results to social class differences in children's language experience (3). Highly educated parents may use language more than less educated parents to transmit information and to regulate their children's behavior. Children whose parents are more educated may acquire a greater set to listen when they are spoken to, to make use of verbal information to acquire knowledge, and to respond to verbal instructions than children whose parents are less educated.

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Table 1

Mean Number of Objects Learned by High (E1) and Low (E2) Education Ss Under Non-Verbal and Verbal Conditions

	Non-Verbal	Verbal	
E1	1.31	3.24	$p < .001$
E2	1.41	1.99	N.S.
	N.S.	$p < .01$	

Table 2

Percentage of High (E1) and Low (E2) Education Ss Who Succeeded in Making an Errorless Shift under Non-Verbal and Verbal Conditions

	Non-Verbal	Verbal	
E1	10%	62%	$p < .01$
E2	16%	20%	N.S.
	N.S.	$p < .01$	